



Published in final edited form as:

Am J Clin Oncol. 2012 February ; 35(1): 22–31. doi:10.1097/COC.0b013e318200598e.

Health Behaviors Among Cancer Survivors Receiving Screening Mammography

Sarah M. Rausch, PhD¹, Shannon Millay, MPH¹, Chris Scott, MS², Sandhya Pruthi, MD², Matthew M. Clark, PhD², Christi Patten, PhD², Daniela Stan, MD², Thomas Sellers, PhD¹, and Celine Vachon, PhD²

Sarah M. Rausch: Sarah.Rausch@Moffitt.org

¹ H. Lee Moffitt Cancer Center, 12902 Magnolia Drive MRC/PSY, Tampa, FL 33612, (813) 745-2194

² Mayo Clinic, 200 First St SW, Rochester, MN 55905, Phone: (507) 284-5849

Abstract

Objectives—The purpose of this study was to evaluate the prevalence of cancer-related behavioral risk factors among female cancer survivors, relative to women without a previous diagnosis of cancer.

Methods—In a large cohort of 19,948 women presenting for screening mammography, questionnaires on health behaviors were administered.

Results—18,510 had detailed history on health behaviors and previous cancer history. Overall 2,713 (14.7%) reported a previous cancer history. We found statistically significant results indicating cancer survivors were *less* likely than those with no cancer history to: report their overall health as “excellent” (13.6% vs. 21.5%), to engage in moderate or strenuous exercise (56.5% vs. 63.3%), and to use complementary and alternative medicine (CAM) (57.4% vs. 60.2%). Conversely, cancer survivors were *more* likely to be current smokers (6.3% vs. 5.5%) rate their overall health as “poor” (15.8% vs. 9.1%), and to report more weight gain over time. Among cancer survivors, differences also emerged by type of primary cancer. For example, cervical cancer survivors (n=370) were most likely to report being current smokers (15.7%) and regular alcohol users (71.7%) compared to other survivors. Ovarian (n=185) and uterine (n=262) cancer survivors most frequently reported being obese (41% and 34.4% respectively). Cervical cancer survivors reported the largest weight gain (4.9 lbs at 5 yrs and 13.4 lbs at 10 yrs).

Conclusions—These results suggest opportunities for tailored behavioral health risk factor interventions for specific populations of cancer survivors.

Introduction

As the population of cancer survivors increases, the importance of health status and quality of life of cancer survivors becomes even more crucial. Approximately 10.5 million people in the U.S. have been diagnosed with cancer at some point in their life, and approximately 1,444,000 new cancers are diagnosed annually.¹ Health behaviors are important for the general population and for cancer survivors. For example, of the 559,650 cancer deaths in 2006, approximately one third were attributable to tobacco use, and an additional one third attributable to poor diet, physical inactivity, and obesity.¹ It has been proposed that over half of all cancers in the U.S. could be prevented if population-wide measures were implemented to promote lifestyle changes including, reducing tobacco use, increasing physical activity, controlling weight and improving diet.²

Due to progress in the diagnosis and treatment of cancer, there is a growing population of cancer survivors, and this number is expected to grow as the US population continues to age. Unfortunately, several studies have demonstrated that cancer survivors are not as healthy as the general population.³⁻⁵ In addition to long-term and late effects of cancer and its treatment, more than 10% of all new primary cancers diagnosed each year are diagnosed in cancer survivors. Finally, cancer survivors face increased risk for other health problems such as weight gain, diabetes and osteoporosis. A number of recent studies have evaluated health behaviors (physical activity, tobacco use, diet, etc.) among cancer survivors.^{6,7} In general, survivors demonstrate similar rates of smoking, inactivity, inadequate diet and obesity to those in the general population, although in some reports cancer survivors report worse health behaviors.^{3,8,9}

To date, much of the research on the effects of behavioral risk factors among cancer survivors has focused exclusively on cigarette smoking, with many studies showing higher incidences of cancer recurrence,¹⁰ subsequent primary cancers,¹¹⁻¹³ and reduced survival time in smokers. Alcohol use has shown similar findings in cancer survivors with findings indicating linkages between alcohol intake and increased risk for primary tumors¹³ and reduced survival time.^{14, 15} Studies of obesity and diet have linked obesity with increased incidence of new cancers, recurrence, and reduced survival time.^{14, 16-18} Information regarding the prevalence of other health behaviors in cancer survivors is limited, and findings are mixed.^{7,9} Thus, there is considerable need for additional studies to document the prevalence of cancer-related behavioral risk factors in a diverse sample of cancer survivors.

Therefore, the primary aim of this study was to evaluate the prevalence of cancer-related behavioral risk factors (e.g. smoking status, alcohol use, physical activity, BMI) among cancer survivors, relative to peers presenting for screening mammography without a previous diagnosis of cancer in a sample of women presenting for mammography. Additionally, health behaviors were compared amongst survivors with various primary tumor types.

Methods

A total of 19,948 women ages 35 and older presenting for screening mammography were enrolled into a mammography cohort study to evaluate new image-based risk factors for breast cancer. They were given a self-administered questionnaire to assess their health behaviors and previous cancer history. Of these women, 18,510 (15797 no cancer history, 2713 cancer survivors) completed the full version of the questionnaire which ascertained health behaviors. Patients reported a prior history of cancer in response to the question "Have you ever been diagnosed with any of the following cancers?" A range was provided for age of prior cancer which did not allow for a precise measure of time since diagnosis. Participants were categorized by primary tumor type for single primary cancers, and placed into a group of "multiple" if they reported more than one type of cancer.

Health behaviors examined included: smoking ("Have you ever smoked cigarettes on a regular basis [that is, more than 100 cigarettes in your entire life]?", "On average, how many cigarettes do/did you smoke per day?" and "Do you currently smoke?"), alcohol ("Over the last year, on average, how often did you drink?"), physical activity ("Considering a 7-day period, how many times on average do you do the following kinds of exercise for more than 15 minutes during your free time?" [options include strenuous, moderate, and mild exercise with examples]), weight ("What is your current weight?", "What was your weight 5 years ago?" and "What was your weight 10 years ago?"), complementary and alternative medicine (CAM) use ("In the past year, have you used any of these treatments or techniques?"

[options included various vitamins, supplements, herbs, treatments and techniques], mammography screening (“About how many times in the past 10 years have you had a mammogram?” and “Do you have regular mammograms? [if yes] How often?”), and overall health rating (“On average, how would you describe your health during the last year?”).

Statistics

Results are summarized as frequency and percent or mean and standard deviation of health behaviors by cancer survivor status (yes/no) and by primary cancer type among survivors. Simple unadjusted differences between those with and without cancer history were tested by Pearson chi-square test or two-sample t-test, as appropriate. In order to account for age differences between those with and without cancer history, generalized linear models were fit including age category as a covariate. Patients with a history of cancer were then divided into groups according to primary tumor location. Differences in patient characteristics between primary tumor type groups were also tested within the generalized linear model framework. Analyses were done both with and without age group as a covariate in the model.

Results

Overall, the mean age of the sample was 58 ± 12 (range 35–96) years, mean BMI was 27 ± 6 kg/m^2 (classified as “overweight”), and 74% of the women had some level of education beyond high school. When comparing the survivors to the noncancer controls, survivors had a higher mean age (62 ± 12 vs. 57 ± 12 years), the same mean BMI (27 ± 6 kg/m^2), and a higher percentage of women with education beyond high school (74% vs. 70.1%). Both unadjusted and adjusted analyses are presented to account for possible confounding effects of age (See Table 1). It should also be noted that any mention of significance in our study results refers to statistical significance.

Regular Mammography Screening

In this sample already presenting for screening mammography, cancer survivors reported engaging in regular mammography more frequently than those with no cancer history (91.1% vs. 86.3%). When considering age, cancer survivors and those with no cancer history had similar rates in those over age 50, however, younger (age 30–49) cancer survivors reported regular mammography more frequently (80.2%) than those with no cancer history (74.3%).

Smoking

Compared to those with no previous cancer history, a smaller proportion of cancer survivors report being “never smokers” (59% vs. 63.7% noncancer group). A larger proportion of survivors report being former smokers (34.6% vs. 30.4%). Rates for current smokers (6.3% survivors vs. 5.9% non cancer controls) were similar. However, results differed by age as those over 65 years had similar rates of smoking whether or not they had a previous cancer but those aged 30–49 had greater rates of current smokers (13% among survivors compared to those with no previous cancer (8.5%).

Alcohol

Cancer survivors were less likely than those with no cancer history to use alcohol monthly or greater (66.9% vs. 71.4%). Younger cancer survivors (30–49) were the most frequent regular alcohol drinkers (79.2%), with “regular” use being defined on the questionnaire as having at least 1 drink per month. Older participants (65+), both cancer survivors and those reporting no cancer history, were less likely to use alcohol (41% of those 65+ report never

using vs. 24.5% of those 30–49 report never using). Younger participants (30–49) were more likely to drink alcohol *regularly* (78.5%) relative to older (65+) participants (61.5%).

Physical Activity

Cancer survivors were less likely than those with no cancer history to engage in strenuous exercise (14.7% vs. 20.9%), which included “activities that caused the heart to beat rapidly such as running or jogging.” Relative to the youngest participants (30–49), older participants (65+) were more likely to engage in mild exercise (42.5%) (vs. 39.3% moderate or 7% strenuous). Mild exercise was defined as “minimal effort activities such as easy walking or playing golf.” Moderate exercise included “not exhausting activities such as fast walking or easy swimming.”

Weight status

BMI did not differ by cancer survivor status. However, cancer survivors reported less weight gain than the noncancer group in the last five years (1.3 lbs vs. 2.5 lbs) and 10 years (7.7 lbs vs. 9.6 lbs). The BMI categories remained similar after accounting for age. However, the mean weight gain across 5 and 10 years was largest for the younger respondents (5 lbs after 5 years; 13 lbs after 10 yrs), whereas those >65 years reported weight *loss* after 5 years. Relative to the youngest participants (30–49) older participants (65+) were more likely to be overweight (35.8% vs. 27.4% in 30–49), report weight loss across 5 years (0.5 lb *loss* vs. 4.8 lb *gain* in 30–49), and older participants reported the least weight gain over 10 years (3.8 lbs; 65+) relative to the youngest participants (13.4 lbs; 30–49 yrs).

CAM Usage

Compared to those without a history of cancer, cancer survivors were more likely to use more than three vitamins (33% vs. 28%). Older participants (65+) were also less likely to use complementary and alternative medicine (49% vs. 65% in those 30–49). Relative to the youngest participants (30–49) older participants (65+) were more likely to use 3+ vitamins (37.9% vs. 17.8%),

Perceived Overall Health

Cancer survivors were less likely than those with no cancer history to report their overall health as “excellent” (13.6% vs. 21.5%). Consistent with those findings, those who reported a cancer history were more likely to rate their overall health as “poor” (15.8% vs. 9.1%). Younger participants (30–49), regardless of cancer history were more likely to rate their overall health as “excellent” (22.7%) than older (65+) participants (11.25%). The oldest cancer survivors (65+) were the least likely to rate their health as “excellent” (8.9%).

Primary Tumor Location

When comparing specific cancer types, cervical cancer survivors (n=370) were unique in their health behaviors. Cervical cancer survivors had one of the highest percentages of those who did not have regular mammography screening (11.2%). Cervical cancer survivors reported the highest rate of current smoking, almost double of that reported by all other cancer survivors (15.7%). Additionally, cervical cancer survivors had the highest percentage using 4+ caffeine drinks daily (23.4%), regular alcohol use (71.1%), being overweight (31.2%) or obese (33.6%), and reported gaining the most weight (4.9 lbs at 5 yrs and 13.4 lbs at 10 yrs). Despite these health risks, cervical cancer survivors also had the highest percentage of those who rated their own health as “excellent” (15.8%), and were least likely than other survivors to rate health as “poor” (14.4%).

When compared to the noncancer group, cervical cancer survivors had higher percentages of current smokers (15.7% vs. 5.9%), women reporting 4+ caffeine drinks daily (23.4% vs. 17.9%), and obesity (33.6% vs. 27.7%), but a similar percentage of regular alcohol use (71.7% vs. 71.4%).

Compared to other cancer groups, lung cancer survivors (n=88) had the second highest frequency of those who engage in regular mammography (93.2%). Lung cancer survivors reported the second highest rates of current smoking (8%), and the largest percentage of former smokers (65%). Lung cancer survivors reported the highest percentage of drinking alcohol daily (17%), engaging in mild exercise (48.2%) – almost no strenuous exercise (3.5%), and the largest proportion of those who reported their height and weight, which classified their calculated BMI in the “normal” range (47.7%). Additionally, lung cancer survivors frequently rated their health as “poor” (29.1%), second only to leukemia survivors.

When compared to the noncancer group, lung cancer survivors had higher percentages of women who engage in regular mammography (93.2% vs. 86.3%), current smokers (8% vs. 5.9%), and more than double the amount of former smokers (65% vs. 30.4%).

When compared to other survivors, leukemia survivors (n=39) most frequently reported engaging in regular mammography screening (94.9%). The highest rates of “never smokers” were leukemia (75.9%) and lymphoma (69%) survivors. Leukemia survivors frequently reported having a normal weight (43.6%). Leukemia survivors most frequently rated their health as “poor” (31.6%).

Compared to the noncancer group, leukemia survivors had more women that engage in regular mammography, (94.9% vs. 86.3%), more “never smokers” (75.9% vs. 63.7%), and a higher percentage of those having a normal weight (43.6% vs. 38.8%).

Melanoma (n=306) survivors were most likely to rate their overall health as “excellent” (15.4%). (21.5% of the noncancer controls rated their health as “excellent”.) Uterine cancer survivors (n=262) reported most frequently using CAM (58.5%). Ovarian and uterine cancer survivors most frequently reported a height and weight classifying them as obese by their calculated BMI (41% and 34.4% respectively). (The noncancer group had 27.7% that were classified as obese.)

Discussion

As the population of cancer survivors continues to increase in this country, gaining a better understanding of their health behaviors can help improve both their health status and their quality of life.¹⁹ Despite the depth of knowledge that has led to the estimation that more than half of cancer deaths in the US are caused by health behaviors such as smoking (30%), poor dietary choices and obesity (25%–30%), and physical inactivity,¹ very little knowledge has been obtained about these health behaviors in cancer survivors.

In this self-report survey of a large sample of women presenting for screening mammography, several differences in health behaviors were found between cancer survivors and those without a previous cancer history, and between primary tumor location amongst cancer survivors. When interpreting these results, it is important to remember that this study sample was already motivated to present for screening mammography and may therefore be a select population with respect to healthier lifestyles. In addition, there is a possibility that some women in the cancer group might have already improved their risk behaviors from where they were before diagnosis. If the women were interviewed prior to diagnosis, we might have observed even riskier behaviors. It should also be noted that women with breast cancer were not included as the purpose of the larger study was to evaluate whether these

cancer-related behavioral risk factors were related to incidence of first primary breast cancer. Thus, our sample is likely not representative of all female cancer survivors.

According to 2005 National Health Interview Survey data, approximately 67% of women 40 years of age and older are presenting for screening mammography.²⁰ In that study, higher rates of mammography were observed in women who were white, saw a general physician or gynecologist in the past 12 months, do not have a disability, aged 50–64, and have more education.²⁰ Consistent with these findings, women who present regularly for mammography screening are known to have a higher education level, family history of breast cancer, prior breast biopsy, annual income >35k, and receive regular care from a gynecologist.²¹ However, these findings are relevant to clinical providers, as this is the sample accessible to clinicians, and mammography may represent a “teachable moment” for behavior changes. As defined in many applications of cancer care, “teachable moment” refers to a specific opportunity, such as at the time of cancer diagnosis or during medical appointments, when an individual can be motivated to adopt healthy behaviors. The individual might experience strong emotions when they perceive that their health is at risk, prompting them to be more open to making positive life changes²².

Although some providers may assume cancer survivors have improved their health behaviors, data from representative population samples, as well as our mammography cohort, suggest this is not true. When cancer survivors present for medical appointments, such as screening mammography, this may represent what has been referred to as a “teachable moment” and an opportunity for providers to educate cancer survivors, and evaluate health behaviors contributing to higher cancer risks.

Strengths of our investigation include a large sample, allowing us to compare those with a previous cancer history and those without a previous cancer history, as well as those in various primary tumor type groups, and age-adjusted rates. We also tested our data for interactions between age and group and we found no interactions for any of our variables of interest.

Health Behaviors and Cancer Survivorship

Regular Mammography Screening—In a sample presenting for screening mammography, we expect rates of reported regular mammography screening to be unusually high. We did find differences in rates between cancer survivors and those with no cancer history, and when comparing rates in age groups, differences emerged only in the young participants. Healthcare professionals and survivors alike have suggested that the cancer experience provides a “teachable moment” where a cancer survivor may be motivated to assess and change behaviors to promote a healthy lifestyle and prevent recurrence,^{6,23} and it is possible that a “teachable moment” has impacted rates of screening mammography for young cancer survivors.

Smoking Status—The current smoking rate found in this study among survivors (6.3%) is much lower compared to the prevalence rates other investigators have found of smoking at approximately 20% in cancer survivors,⁴ with higher rates in younger cancer survivors.⁸ In a population based investigation,⁸ cancer survivors were similar to controls with respect to smoking status (20.2% survivors currently smoking, 23.6% non cancers currently smoking), but they found younger survivors (18–40) were at greater risk for continued smoking. We found similar results in that young survivors (age 30–49) were the most likely (13% vs. 8.5% in young noncancer controls vs 3% of older [65+] survivors) to be current smokers.

Alcohol Usage—Our prevalence of 14.8% of daily alcohol usage among survivors over age 65 is similar to results from Bellizzi and colleagues⁸ who reported that 20% of survivors >65 years reported daily alcohol use, similar to those without a cancer history (18%), which can raise concern for substance issues in this age cohort. We also found that survivors were slightly less likely to report regular alcohol use (66.9% vs. 71.4% in noncancer controls). Additionally, young cancer survivors (age 30–49) were most likely to report regular alcohol use (79.2%) relative to age groups in both survivors and those with no cancer history.

Physical Activity Level—The American Cancer Society and Healthy People 2010 recommend that adults achieve at least 30 minutes of physical activity most days of the week. Bellizzi and colleagues⁸ found that only 29% of cancer survivors met the recommended physical activity guidelines. In another study⁵ only 10% identified physical activity as a cancer prevention behavior. Physical activity has been shown to improve cancer survivors' QOL,^{19,24–26} fatigue,^{25,26} cancer risk²⁷ and prognosis,²⁸ leading us to believe that more work needs to be done to increase rates of adherence to physical activity guidelines so that cancer survivors see these benefits.

Coups and Ostroff⁹ reported in their nationally representative sample that rates of physical inactivity for cancer survivors and non-cancer controls did not differ by age group, except in 40–64 year olds in which physical inactivity was higher for cancer survivors (74.8%) than non-cancer controls. They also found the age-stratified prevalence of being overweight was comparable for cancer survivors and non-cancer controls. Among cancer survivors, prevalence of being overweight was highest among those aged 40–64 (67.6%).

We found that cancer survivors were not more likely to report engagement in physical activity than those with no cancer history. When rating type of physical activity, cancer survivors were less likely than the noncancer controls to engage in moderate (41.8% vs. 42.4%) and strenuous (14.7% vs. 20.9%) physical activity, but more likely to engage in mild physical activity (33.5% vs. 28.1%). Survivors were also more likely to report no physical activity (10% vs 8.6%), even after controlling for age. Given the numerous benefits of physical activity for the cancer survivor, assessing physical activity level and then providing counseling when indicated may help improve the overall health of cancer survivors.

Weight Classification—Being overweight is associated with a number of cancers and other chronic illnesses. Obesity may also contribute to recurrence rates and poorer prognosis in breast, prostate, and colon cancer survivors.^{29,30} Obese women have an increased relative risk of endometrial cancer 2.9–10.0 fold greater than normal weight women.³¹ However, in Mayer and colleagues 2007 study⁵ of approximately 600 survivors and 2,000 population controls, over half of respondents were overweight or obese in both groups, and only 2% identified losing weight as a cancer prevention behavior. While we did not find that cancer survivors were more likely to be obese, we did find that cancer survivors reported greater weight gain across 5- and 10-year periods. This finding highlights the importance of assessing weight classification and providing counseling for weight gain prevention when needed.

CAM—Similar to other investigators more than half of our sample endorsed some form of CAM usage. It is important for medical providers to ask about CAM usage as CAM therapies can both beneficially and adversely affect cancer survivors. Several vitamins and supplements are contraindicated for patients in cancer treatment since they interact with prescribed medications (e.g. Tamoxifen). With reports of up to 80% of cancer patients utilizing some form of CAM therapy,³² it is important for providers to comfortably query patients, and to understand how the survivors' CAM usage affects their health status. In this sample, 80.4% of survivors and 60.2% of those with no cancer history reported taking

vitamins. 32.6% of survivors reported using more than 3 vitamins. Although cancer survivors were less likely than those who reported no cancer history to use complementary and alternative medicine (CAM) (57.4% vs. 60.2%), the frequency of both vitamin and CAM use remains high, further highlighting the need to better understand the effects, mechanisms, side effects, drug interactions, and contraindications of CAM therapies.

Primary Tumor Type and Health Behaviors—While the impact of tumor type on type of screening, treatment and mortality has been widely investigated, how tumor type may impact health behaviors is not well understood. In this survey cervical cancer survivors reported having very unhealthy lifestyles. This is not surprising since others have found that women with cervical and endometrial cancers report much higher rates of smoking than those with any other cancer diagnosis.⁵ Coups and Ostroff⁹ reported higher rates of current smokers in cervical cancer (46%) and uterine cancers (29%) than all other cancers, and relative to controls. Similarly, in this sample, cervical cancer survivors reported higher rates (double) of smoking, regular alcohol use, and weight gain than all other survivors

In a population based investigation,⁸ cancer survivors were similar to controls with respect to their alcohol consumption. However, among survivors, Bellizi and colleagues⁸ also reported a higher proportion of moderate-heavy alcohol use in prostate, lung, larynx, and pharynx survivors. In this sample, although cervical cancer survivors most frequently reported “regular” alcohol use (71.1%), lung cancer survivors most frequently reported daily alcohol use (17%).

In Bellizi’s study,⁸ a higher proportion of survivors were likely to meet recommended levels of physical activity than noncancer controls, and among the female survivors, the gynecologic cancers had higher rates of physical activity. We found different types of physical activity among the different survivors. Cervical (18.8%) and melanoma (17.1%) patients reported more strenuous exercise. Lung (48%), ovarian (39.8%) and colon (40.1%) cancer patients were more likely to report mild exercise, and leukemia (46.2%) survivors are more likely to report moderate exercise.

Limitations

Limitations of this study include using a cross-sectional sample from a mammography cohort. Thus, a motivated sample presenting to a clinic for mammography screening may not generalize to the general female population. However, nationwide, over 60% of U.S. women over age 40 present for mammography screening annually, providing a rich opportunity for possible intervention and further assessment, in a population motivated to have cancer screening. Additionally, information on exact age of cancer diagnosis was not available, limiting our ability to examine our results by time since diagnosis. Recent vs. long term survivors may differ with regard to their health behaviors. It should be noted that some survey questions relied on recall, which might lead to differences in responses between recent and long term survivors.

As mentioned in the Discussion, another limitation is that the women in the cancer group were only able to be interviewed *after* their cancer diagnosis. It is possible that some women might have already improved their risk behaviors from where they were before diagnosis, so riskier health behaviors could have been observed if the women had been interviewed prior to diagnosis. Finally, this study represents a population of Caucasian women primarily from the Midwest region, which may present additional limitations to the ability to generalize our findings to more diverse and underserved populations.

Summary

With 22 million cancer survivors, it is essential for healthcare providers to understand the health behavior needs of these patients. Additional information on behavioral risk factors will help to determine the potential need for behavioral risk factor assessments and targeted behavioral risk factor interventions in our country's ever growing population of cancer survivors. Tailored interventions have the potential to improve the QOL in cancer survivors, as well as decrease recurrence, morbidity, and mortality. In this sample, cancer survivors had worse health behaviors than those who had no cancer history. Cancer survivors were more likely to be current smokers, report more weight gain, and rate their overall health as "poor." Of the specific cancer groups in this study, cervical cancer survivors reported the highest frequency of current smoking, daily alcohol use, and weight gain across 5- and 10-year periods. These results were consistent with previous population health studies and suggest that tailored behavioral risk factor interventions would be beneficial.

Acknowledgments

This project is funded in part by the NCI (5R01CA097396; Vachon, PI)

References

1. ACS. Cancer Facts and Figures. 2007. Accessed from : <http://www.cancer.org/downloads/STT/CAFF2007PWSecured.pdf>
2. Stein CJ, Colditz GA. Modifiable risk factors for cancer. *British Journal of Cancer*. 2004; 90:299–303. [PubMed: 14735167]
3. Yabroff, K Robin; Lawrence, William F.; Clauser, Steven; Davis, William W.; Brown, Martin L. Burden of Illness in Cancer Survivors: Findings from a Population-Based National Sample. *Journal of the National Cancer Institute*. 2004; 96(17):1322–1330. [PubMed: 15339970]
4. Hewitt M, Breen N, Devesa S. Cancer Prevalence and Survivorship Issues: Analyses of the 1992 National Health Interview Survey. *Journal of the National Cancer Institute*. 91(17):1480–1486. [PubMed: 10469749]
5. Mayer DK, Terrin NC, Menon U, Kreps GL, McCance K, Parsons SK, Mooney KH. Screening practices in cancer survivors. *Journal of Cancer Survivorship*. 2007; 1:17–26. [PubMed: 18648941]
6. Demarck-Wahnfried, et al. Lifestyle interventions to reduce cancer risk and improve outcomes. In: Demarck-Wahnfried, W.; Rock, CL.; Patrick, K.; Byers, T., editors. *Am Fam Physician*. Vol. 2008. Vol. 77. 2005 Jun 1. p. 1573-8.
7. Pinto BM, Eakin E, Maruyama NC. Health behavior changes after a cancer diagnosis: what do we know and where to we go from here? *Annals of Behavioral Medicine*. 2000; 22:38–52. [PubMed: 10892527]
8. Bellizzi KM, Rowland JH, Jeffery DD, McNeel T. Health Behaviors of Cancer Survivors: Examining Opportunities for Cancer Control Intervention. *Journal of Clinical Oncology*. 2005; 23:8884–8893. [PubMed: 16314649]
9. Coups EJ, Ostroff JS. A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. *Preventive Medicine*. 2005; 40:702–711. [PubMed: 15850868]
10. Stevens MH, Gardner JW, Parkin JL, Johnson LP. Head and neck cancer survival and life-style change. *Archives of Otolaryngology*. 1983; 109:746–749. [PubMed: 6639443]
11. Kawahara M, Ushijima S, Kamimori T, et al. Second primary tumours in more than 2-year disease-free survivors of small-cell lung cancer in Japan: the role of smoking cessation. *British Journal of Cancer*. 1998; 78:409–12. [PubMed: 9703291]
12. Khuri FR, Kim ES, Lee JJ, et al. The impact of smoking status, disease stage, and index tumor site on second primary tumor incidence and tumor recurrence in the head and neck retinoid chemoprevention trial. *Cancer Epidemiology, Biomarkers, and Prevention*. 2001; 10:823–829.

13. Do KA, Johnson MM, Doherty DA, et al. Second primary tumors in patients with upper aerodigestive tract cancers: joint effects of smoking and alcohol (United States). *Cancer Causes Control*. 2003; 14:131–138. [PubMed: 12749718]
14. Hebert JR, Hurley TG, Ma Y. The effect of dietary exposures on recurrence and mortality in early stage breast cancer. *Breast Cancer Res Treat*. 1998; 51:17–28. [PubMed: 9877026]
15. McDonald PG, Williams R, Dawkins F, Adams-Campbell LL. Breast cancer survival in African American women: is alcohol consumption a prognostic indicator? *Cancer Causes and Control*. 2002; 13:543–549. [PubMed: 12195644]
16. Bastarrachea J, Hortobagyi GN, Smith TL, Kau SW, Buzdar AU. Obesity as an adverse prognostic factor for patients receiving adjuvant chemotherapy for breast cancer. *Annals of Internal Medicine*. 1994; 120:18–25. [PubMed: 8250452]
17. Daling JR, Malone KE, Doody DR, Johnson LG, Gralow JR, Porter PL. Relation of body mass index to tumor markers and survival among young women with invasive ductal breast carcinoma. *Cancer*. 2001; 92:720–729. [PubMed: 11550140]
18. Senie RT, Rosen PP, Rhodes P, Lesser ML, Kinne DW. Obesity at diagnosis of breast carcinoma influences duration of disease-free survival. *Annals of Internal Medicine*. 1992; 116:26–32. [PubMed: 1727092]
19. Clark MM, Novotny PJ, Patten CA, Rausch SM, Garces YI, Jatoi A, Sloan JA, Yang P. Motivational readiness for physical activity and quality of life in long-term lung cancer survivors. *Lung Cancer*. 2008; 61(1):117–122. [PubMed: 18243406]
20. Breen N, Cronin KA, Meissner HI, Taplin SH, Tangka FK, Tiro JA, McNeel TS. Reported drop in mammography: Is this cause for concern? *Cancer*. 2007; 109(12):2405–2409. [PubMed: 17503429]
21. Lee JR, Vogel VG. Who uses screening mammography regularly? *Cancer Epidemiology, Biomarkers & Prevention*. 1995; 4(8):901–6.
22. McBride CM, Ostroff JS. Teachable moments for promoting smoking cessation: The context of cancer care and survivorship. *Cancer Control*. 2003; 10:325–333. [PubMed: 12915811]
23. Brown JK, Byers T, Doyle C, Courneya KS, Demark-Wahnefried W, Kushi LH, McTiernan A, Rock CL, Aziz N, Bloch AS, Eldridge B, Hamilton K, Katzin C, Koonce A, Main J, Mobley C, Morra ME, Pierce MS, Sawyer KA. Nutrition and Physical Activity During and After Cancer Treatment: An American Cancer Society Guide for Informed Choices. *Cancer J Clin*. 2003; 53:268.
24. Courneya KS. Exercise interventions during cancer treatment: biopsychosocial outcomes. *Exercise Sport Science Reviews*. 2001; 29:60–64.
25. Galvão DA, Newton RU. Review of exercise intervention studies in cancer patients. *Journal of Clinical Oncology*. 2005; 23:899–909. [PubMed: 15681536]
26. Stevinson C. Exercise interventions for cancer patients: systematic review of controlled trials. *Cancer Causes Control*. 2004; 15:1035–56. [PubMed: 15801488]
27. McTiernan A. Obesity and cancer: the risks, science, and potential management strategies. *Oncology (Williston Park)*. 2005 Jun.200519(7):87181. discussion 881–2, 885–6.
28. McTiernan A. Physical activity after cancer: physiologic outcomes. *Cancer Invest*. 2004; 22(1):68–81. Review. [PubMed: 15069764]
29. Irwin ML, McTiernan A, Bernstein L, Gilliland FD, Baumgartner R, Baumgartner K, Ballard-Barbash R. Relationship of obesity and physical activity with C-peptide, leptin, and insulin-like growth factors in breast cancer survivors. *Cancer Epidemiol Biomarkers Prev*. 2005 Dec; 14(12):2881–8. [PubMed: 16365005]
30. Strom SS, Wang X, Pettaway CA, Logothetis CJ, Yamamura Y, Do KA, Babaian RJ, Troncso P. Obesity, weight gain, and risk of biochemical failure among prostate cancer patients following prostatectomy. *Clin Cancer Res*. 2005 Oct 1; 11(19 Pt 1):6889–94. [PubMed: 16203779]
31. Cook, LS.; Doherty, JA.; Chen, C. *Endometrial Cancer*. 3. New York: Oxford University Press; 2006.
32. Bernstein BJ, Grasso T. Prevalence of complementary and alternative medicine use in cancer patients. *Oncology*. 2001; 15(10):1267–1272. [PubMed: 11702957]

Table 1

Prevalence of Health Behaviors by Previous Cancer Status.

Variable	Level	No previous cancer	Previous cancer	Unadjusted p-value	Age adjusted P-Value
Age at Questionnaire	35-49	5117 (32.4%)	523 (19.3%)	<.001	.
	50-64	6223 (39.4%)	948 (34.9%)	.	.
	65+	4457 (28.2%)	1242 (45.8%)	.	.
Regular Mammograms	missing	178 (1%)	37 (1%)	<.001	<.001
	No	2143 (13.7%)	239 (8.9%)	.	.
	Yes	13476 (86.3%)	2437 (91.1%)	.	.
Smoking status	missing	4 (0%)	0 (0%)	<.001	<.001
	never	10053 (63.7%)	1602 (59%)	.	.
	former	4807 (30.4%)	939 (34.6%)	.	.
	current	933 (5.9%)	172 (6.3%)	.	.
Regular Alcohol Use?	missing	30(%)	0 (0%)	<.001	0.033
	No	4510 (28.6%)	899 (33.1%)	.	.
	Yes	11284 (71.4%)	1814 (66.9%)	.	.
Caffeine intake	missing	120 (1%)	18 (1%)	<.001	0.230
	no	2285 (14.6%)	478 (17.7%)	.	.
	1 or less/day	3899 (24.9%)	676 (25.1%)	.	.
	2 to 3/day	6680 (42.6%)	1085 (40.3%)	.	.
	4+/day	2813 (17.9%)	456 (16.9%)	.	.
Physical Activity	missing	205 (1%)	32 (1%)	<.001	0.013
	low/none	1342 (8.6%)	267 (10%)	.	.
	mild only	4382 (28.1%)	899 (33.5%)	.	.
	moderate only	6604 (42.4%)	1121 (41.8%)	.	.

Variable	Level	No previous cancer	Previous cancer	Unadjusted p-value	Age adjusted P-Value
	strenuous	3264 (20.9%)	394 (14.7%)	.	.
BMI Categories *	missing	36 (0%)	4 (0%)	0.010	<.001
	under	196 (1.2%)	55 (2%)	.	.
	normal	6109 (38.8%)	1064 (39.3%)	.	.
	overwt	5097 (32.3%)	831 (30.7%)	.	.
	obese	4359 (27.7%)	759 (28%)	.	.
Weight change over last 5yrs	Mean (N, S.D.)	2.5 (15670, 19.1)	1.3 (2696, 18.9)	<.001	0.218
Weight change over last 10yrs	Mean (N, S.D.)	9.6 (15564, 21.64)	7.7 (2672, 22.15)	<.001	0.337
Overall Health Assessment	missing	274 (1.7%)	45 (1.6%)	<.001	<.001
	excellent	3338 (21.5%)	362 (13.6%)	.	.
	very good	6115 (39.4%) 1	922 (34.6%)	.	.
	good	4651 (30%)	962 (36.1%)	.	.
	fair/poor	1419 (9.1%)	422 (15.8%)	.	.
Number of Vitamins Used	Mean (N, S.D.)	2.1 (15534, 2.29)	2.3 (2671, 2.32)	<.001	0.249
Categorical # Vitamins	missing	263 (1.6%)	42 (1.5%)	<.001	0.212
	None	3788 (24.4%)	524 (19.6%)	.	.
	1	3721 (24%)	636 (23.8%)	.	.
	2	3680 (23.7%)	640 (24%)	.	.
	3+	4345 (28%)	871 (32.6%)	.	.
Number of CAM Modalities Used	Mean (N, S.D.)	1.1 (15408, 1.25)	1.1 (2634, 1.23)	0.030	0.508
Categorical # CAM	missing	389 (2.4%)	79 (2.9%)	0.060	0.538

Variable	Level	No previous cancer	Previous cancer	Unadjusted p-value	Age adjusted P-Value
	None	6129 (39.8%)	1120 (42.5%)	.	.
	1	4546 (29.5%)	751 (28.5%)	.	.
	2	2806 (18.2%)	449 (17%)	.	.
	3+	1927 (12.5%)	314 (11.9%)	.	.
Number of Supplements	Mean (N, S.D.)	0.2 (14985, 0.65)	0.2 (2574, 0.67)	0.320	0.091
Categorical # supplements	missing	812 (5.1%)	139 (5.1%)	0.540	0.165
	None	12671 (84.6%)	2149 (83.5%)	.	.
	1	1597 (10.7%)	298 (11.6%)	.	.
	2	448 (3%)	78 (3%)	.	.
	3+	269 (1.8%)	49 (1.9%)	.	.

note:

* BMI<18.5 = underweight; BMI 18.5–24.9=normal weight; BMI 25–29.9=overweight; BMI>30=obese

Table 2

Health Behaviors by Age and Previous Cancer

Variable	Level	No Previous Cancer			Previous Cancer		
		Age 30-49	Age 50-64	Age 65+	Age 30-49	Age 50-64	Age 65+
Regular Mammography	Missing	78 (1.5%)	42 (0.6%)	58 (1.3%)	8 (1.5%)	9 (1.7%)	20 (3.8%)
	No	1294 (25.7%)	522 (8.4%)	327 (7.4%)	102 (19.8%)	63 (6.7%)	74 (6.1%)
	Yes	3745 (74.3%)	5659 (91.6%)	4072 (92.6%)	413 (80.2%)	876 (93.3%)	1148 (93.9%)
Smoke N/F/C	Missing	2 (0%)	0 (0%)	2 (0%)	0 (0%)	0 (0%)	0 (0%)
	never	3436 (67.2%)	3747 (60.2%)	2870 (64.4%)	314 (60%)	504 (53.2%)	784 (63.1%)
	former	1245 (24.3%)	2108 (33.9%)	1454 (32.6%)	141 (27%)	377 (39.8%)	421 (33.9%)
Regular Alcohol Use?	current	434 (8.5%)	368 (5.9%)	131 (2.9%)	68 (13%)	67 (7.1%)	37 (3%)
	Missing	2 (0%)	0 (0%)	1 (0%)	0 (0%)	0 (0%)	0 (0%)
	No	1128 (22.1%)	1694 (27.2%)	1688 (37.9%)	109 (20.8%)	306 (32.3%)	484 (39%)
Frequency of Alcohol use	Yes	3987 (77.9%)	4529 (72.8%)	2768 (62.1%)	414 (79.2%)	642 (67.7%)	758 (61%)
	Missing	8 (0.1%)	13 (0.2%)	8 (0.1%)	1 (0.1%)	0 (0%)	2 (0.1%)
	daily	336 (6.6%)	680 (11%)	564 (12.7%)	26 (5%)	105 (11.1%)	183 (14.8%)
Caffeine usage	weekly	1570 (30.7%)	1687 (27.2%)	857 (19.3%)	166 (31.8%)	224 (23.6%)	212 (17.1%)
	monthly	1936 (37.9%)	1966 (31.7%)	1222 (27.5%)	205 (39.3%)	279 (29.4%)	330 (26.6%)
	never	1267 (24.8%)	1877 (30.2%)	1806 (40.6%)	125 (23.9%)	340 (35.9%)	515 (41.5%)
Physical Activity	Missing	27 (0.5%)	33 (0.5%)	60 (1.3%)	3 (0.5%)	7 (0.7%)	8 (0.6%)
	no	559 (11%)	814 (13.2%)	912 (20.7%)	50 (9.6%)	154 (16.4%)	274 (22.2%)
	1 or less/day	1271 (25%)	1525 (24.6%)	1103 (25.1%)	137 (26.3%)	207 (22%)	332 (26.9%)
BMI*	2 to 3/day	2289 (45%)	2673 (43.2%)	1718 (39.1%)	228 (43.8%)	399 (42.4%)	458 (37.1%)
	4+/day	971 (19.1%)	1178 (19%)	664 (15.1%)	105 (20.2%)	181 (19.2%)	170 (13.8%)
	Missing	20 (0.3%)	43 (0.6%)	142 (3.1%)	1 (0.1%)	7 (0.7%)	24 (1.9%)
Physical Activity	low/none	329 (6.5%)	506 (8.2%)	507 (11.7%)	41 (7.9%)	97 (10.3%)	129 (10.6%)
	mild only	976 (19.1%)	1643 (26.6%)	1763 (40.9%)	103 (19.7%)	259 (27.5%)	537 (44.1%)
	moderate only	2048 (40.2%)	2838 (45.9%)	1718 (39.8%)	220 (42.1%)	428 (45.5%)	473 (38.8%)
BMI*	strenuous	1744 (34.2%)	1193 (19.3%)	327 (7.6%)	158 (30.3%)	157 (16.7%)	79 (6.5%)
	Missing	8 (0%)	18 (0.2%)	10 (0.2%)	1 (0.1%)	1 (0.1%)	2 (0.2%)

Variable	Level	No Previous Cancer			Previous Cancer		
		Age 30-49	Age 50-64	Age 65+	Age 30-49	Age 50-64	Age 65+
	under	69 (1.4%)	58 (0.9%)	69 (1.6%)	10 (1.9%)	18 (1.9%)	27 (2.2%)
	normal	2254 (44.1%)	2203 (35.5%)	1652 (37.1%)	229 (43.9%)	357 (37.7%)	478 (38.5%)
	overwt	1422 (27.8%)	2017 (32.5%)	1658 (37.3%)	141 (27%)	265 (28%)	425 (34.3%)
	obese	1364 (26.7%)	1927 (31.1%)	1068 (24%)	142 (27.2%)	307 (32.4%)	310 (25%)
Weight change over last 5 years	Mean (N, S.D.)	4.3 (5088, 21.65)	3 (6175, 19.74)	-0.3 (4407, 14.09)	5.4 (520, 21.8)	1.6 (943, 21.91)	-0.7 (1233, 14.25)
Weight change over last 10 years	Mean (N, S.D.)	13 (5074, 23.74)	10.7 (6132, 22.03)	4.1 (4358, 17)	13.7 (519, 24.07)	9.8 (930, 24.82)	3.6 (1223, 17.96)
Health Assessment	Missing	42 (0.8%)	95 (1.5%)	137 (3.1%)	2 (0.3%)	10 (1.1%)	33 (2.7%)
	excellent	1321 (26%)	1429 (23.3%)	588 (13.6%)	101 (19.4%)	153 (16.3%)	108 (8.9%)
	very good	2102 (41.4%)	2425 (39.6%)	1588 (36.8%)	203 (39%)	346 (36.9%)	373 (30.9%)
	good	1292 (25.5%)	1734 (28.3%)	1625 (37.6%)	147 (28.2%)	282 (30.1%)	533 (44.1%)
	fair/poor	360 (7.1%)	540 (8.8%)	519 (12%)	70 (13.4%)	157 (16.7%)	195 (16.1%)
Number of Vitamins Used	Mean (N, S.D.)	1.5 (5015, 2.13)	2.2 (6137, 2.33)	2.5 (4382, 2.26)	1.6 (510, 2.22)	2.2 (933, 2.33)	2.6 (1228, 2.3)
Categorical # Vitamins	Missing	102 (1.9%)	86 (1.3%)	75 (1.6%)	13 (2.4%)	15 (1.6%)	14 (1.1%)
	None	1945 (38.8%)	1278 (20.8%)	565 (12.9%)	178 (34.9%)	194 (20.8%)	152 (12.4%)
	1	1354 (27%)	1405 (22.9%)	962 (22%)	137 (26.9%)	223 (23.9%)	276 (22.5%)
	2	904 (18%)	1558 (25.4%)	1218 (27.8%)	96 (18.8%)	216 (23.2%)	328 (26.7%)
	3+	812 (16.2%)	1896 (30.9%)	1637 (37.4%)	99 (19.4%)	300 (32.2%)	472 (38.4%)
Number of CAM Modalities Used	Mean (N, S.D.)	1.2 (5041, 1.31)	1.2 (6091, 1.31)	0.8 (4276, 1.02)	1.4 (515, 1.41)	1.3 (931, 1.3)	0.8 (1188, 1.01)
Categorical # CAM	Missing	76 (1.4%)	132 (2.1%)	181 (4.1%)	8 (1.5%)	17 (1.8%)	54 (4.3%)
	None	1805 (35.8%)	2232 (36.6%)	2092 (48.9%)	175 (34%)	329 (35.3%)	616 (51.9%)
	1	1509 (29.9%)	1765 (29%)	1272 (29.7%)	141 (27.4%)	265 (28.5%)	345 (29%)
	2	1012 (20.1%)	1174 (19.3%)	620 (14.5%)	108 (21%)	189 (20.3%)	152 (12.8%)
	3+	715 (14.2%)	920 (15.1%)	292 (6.8%)	91 (17.7%)	148 (15.9%)	75 (6.3%)
Number of Supplements Used	Mean (N, S.D.)	0.2 (4932, 0.62)	0.3 (5900, 0.72)	0.2 (4153, 0.56)	0.3 (498, 0.8)	0.3 (899, 0.67)	0.2 (1177, 0.59)
Categorical # Supplements	Missing	185 (3.6%)	323 (5.1%)	304 (6.8%)	25 (4.7%)	49 (5.2%)	65 (5.2%)
	None	4204 (85.2%)	4831 (81.9%)	3636 (87.6%)	407 (81.7%)	724 (80.5%)	1018 (86.5%)
	1	503 (10.2%)	732 (12.4%)	362 (8.7%)	62 (12.4%)	129 (14.3%)	107 (9.1%)
	2	143 (2.9%)	201 (3.4%)	104 (2.5%)	15 (3%)	29 (3.2%)	34 (2.9%)

Variable	Level	No Previous Cancer			Previous Cancer		
		Age 30-49	Age 50-64	Age 65+	Age 30-49	Age 50-64	Age 65+
	3+	82 (1.7%)	136 (2.3%)	51 (1.2%)	14 (2.8%)	17 (1.9%)	18 (1.5%)

Table 3

Health Behaviors by Primary Tumor Type

Variable	Level	Ovarian	Uterine	Cervical	Lung	Colon	Lymphoma	Leukemia	Melanoma	Brain	Other	Multiple	Unadjusted p-value	Age Adjusted p-value
Age at Questionnaire	35-49	20 (16.8%)	21 (12.7%)	95 (34.4%)	0 (0%)	5 (3.6%)	25 (23.1%)	5 (17.9%)	59 (23.7%)	7 (87.5%)	220 (18.8%)	34 (12.1%)	<.001	.
	50-64	47 (39.5%)	58 (35.2%)	121 (43.8%)	18 (36.7%)	36 (26.3%)	32 (29.6%)	10 (35.7%)	91 (36.5%)	1 (12.5%)	401 (34.2%)	98 (34.8%)	.	.
	65+	52 (43.7%)	86 (52.1%)	60 (21.7%)	31 (63.3%)	96 (70.1%)	51 (47.2%)	13 (46.4%)	99 (39.8%)	0 (0%)	550 (47%)	150 (53.2%)	.	.
Regular Mammograms	Missing	0 (%)	2 (%)	3 (%)	0 (%)	2 (%)	1 (%)	0 (%)	3 (%)	0 (%)	23 (%)	1 (%)	0.520	0.954
	No	8 (6.7%)	10 (6.1%)	33 (12.1%)	3 (6.1%)	9 (6.7%)	12 (11.2%)	1 (3.6%)	23 (9.3%)	1 (12.5%)	97 (8.4%)	25 (8.9%)	.	.
Smoke N/F/C	Yes	111 (93.3%)	153 (93.9%)	240 (87.9%)	46 (93.9%)	126 (93.3%)	95 (88.8%)	27 (96.4%)	223 (90.7%)	7 (87.5%)	1051 (91.6%)	256 (91.1%)	.	.
	never	82 (68.9%)	101 (61.2%)	107 (38.8%)	11 (22.4%)	77 (56.2%)	73 (67.6%)	21 (75%)	166 (66.7%)	5 (62.5%)	733 (62.6%)	154 (54.6%)	<.001	<.001
	former	29 (24.4%)	57 (34.5%)	123 (44.6%)	33 (67.3%)	52 (38%)	33 (30.6%)	7 (25%)	69 (27.7%)	2 (25%)	386 (33%)	109 (38.7%)	.	.
Regular Alcohol Use?	current	8 (6.7%)	7 (4.2%)	46 (16.7%)	5 (10.2%)	8 (5.8%)	2 (1.9%)	0 (0%)	14 (5.6%)	1 (12.5%)	52 (4.4%)	19 (6.7%)	.	.
	No	49 (41.2%)	54 (32.7%)	78 (28.3%)	16 (32.7%)	55 (40.1%)	41 (38%)	15 (53.6%)	69 (27.7%)	3 (37.5%)	368 (31.4%)	102 (36.2%)	0.020	0.070
	Yes	70 (58.8%)	111 (67.3%)	198 (71.7%)	33 (67.3%)	82 (59.9%)	67 (62%)	13 (46.4%)	180 (72.3%)	5 (62.5%)	803 (68.6%)	180 (63.8%)	.	.
Frequency of Alcohol Use	Missing	0 (%)	0 (%)	0 (%)	0 (%)	0 (%)	0 (%)	0 (%)	0 (%)	0 (%)	1 (%)	1 (%)	0.010	0.246
	daily	8 (6.7%)	19 (11.5%)	24 (8.7%)	9 (18.4%)	17 (12.4%)	15 (13.9%)	3 (10.7%)	32 (12.9%)	0 (0%)	144 (12.3%)	29 (10.3%)	.	.
	weekly	23 (19.3%)	36 (21.8%)	85 (30.8%)	11 (22.4%)	30 (21.9%)	25 (23.1%)	3 (10.7%)	57 (22.9%)	4 (50%)	250 (21.4%)	54 (19.2%)	.	.
	monthly	36 (30.3%)	50 (30.3%)	84 (30.4%)	10 (20.4%)	31 (22.6%)	26 (24.1%)	6 (21.4%)	85 (34.1%)	1 (12.5%)	372 (31.8%)	82 (29.2%)	.	.
	never	52 (43.7%)	60 (36.4%)	83 (30.1%)	19 (38.8%)	59 (43.1%)	42 (38.9%)	16 (57.1%)	75 (30.1%)	3 (37.5%)	404 (34.5%)	116 (41.3%)	.	.
													.	.

Variable	Level	Ovarian	Uterine	Cervical	Lung	Colon	Lymphoma	Leukemia	Melanoma	Brain	Other	Multiple	Unadjusted p-value	Age Adjusted p-value
Caffeine usage	Missing	1 (1%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (1%)	1 (1%)	7 (7%)	6 (6%)	0.210	0.392
	no	18 (15.3%)	34 (20.6%)	42 (15.3%)	14 (28.6%)	24 (17.5%)	18 (16.8%)	5 (17.9%)	44 (17.7%)	2 (28.6%)	208 (17.9%)	51 (18.5%)	.	.
	1 or less/day	31 (26.3%)	45 (27.3%)	54 (19.6%)	9 (18.4%)	32 (23.4%)	26 (24.3%)	13 (46.4%)	62 (25%)	1 (14.3%)	304 (26.1%)	69 (25%)	.	.
	2 to 3/day	49 (41.5%)	60 (36.4%)	111 (40.4%)	17 (34.7%)	59 (43.1%)	49 (45.8%)	6 (21.4%)	99 (39.9%)	2 (28.6%)	477 (41%)	108 (39.1%)	.	.
	4+/day	20 (16.9%)	26 (15.8%)	68 (24.7%)	9 (18.4%)	22 (16.1%)	14 (13.1%)	4 (14.3%)	43 (17.3%)	2 (28.6%)	175 (15%)	48 (17.4%)	.	.
Physical Activity	Missing	2 (2%)	2 (2%)	2 (2%)	2 (2%)	3 (3%)	1 (1%)	0 (0%)	4 (4%)	1 (1%)	5 (5%)	7 (7%)	<.001	0.442
	low/none	11 (9.4%)	16 (9.8%)	28 (10.2%)	3 (6.4%)	18 (13.4%)	13 (12.1%)	6 (21.4%)	17 (6.9%)	0 (0%)	104 (8.9%)	33 (12%)	.	.
	mild only	42 (35.9%)	54 (33.1%)	80 (29.2%)	25 (53.2%)	53 (39.6%)	34 (31.8%)	5 (17.9%)	81 (33.1%)	0 (0%)	383 (32.8%)	106 (38.5%)	.	.
	moderate only	49 (41.9%)	71 (43.6%)	108 (39.4%)	17 (36.2%)	53 (39.6%)	46 (43%)	13 (46.4%)	102 (41.6%)	5 (71.4%)	505 (43.3%)	106 (38.5%)	.	.
	strenuous	15 (12.8%)	22 (13.5%)	58 (21.2%)	2 (4.3%)	10 (7.5%)	14 (13.1%)	4 (14.3%)	45 (18.4%)	2 (28.6%)	174 (14.9%)	30 (10.9%)	.	.
BMI Categories*		0 (0%)	0 (0%)	1 (1%)	0 (0%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0.010	0.008
	under	1 (0.8%)	1 (0.6%)	9 (3.3%)	0 (0%)	3 (2.2%)	2 (1.9%)	0 (0%)	10 (4%)	0 (0%)	20 (1.7%)	8 (2.8%)	.	.
	normal	45 (37.8%)	61 (37%)	85 (30.9%)	26 (53.1%)	52 (38.5%)	43 (39.8%)	13 (46.4%)	98 (39.4%)	1 (12.5%)	489 (41.8%)	101 (35.8%)	.	.
	overwt	29 (24.4%)	44 (26.7%)	91 (33.1%)	12 (24.5%)	51 (37.8%)	34 (31.5%)	8 (28.6%)	80 (32.1%)	3 (37.5%)	361 (30.9%)	80 (28.4%)	.	.
	obese	44 (37%)	59 (35.8%)	90 (32.7%)	11 (22.4%)	29 (21.5%)	29 (26.9%)	7 (25%)	61 (24.5%)	4 (50%)	300 (25.6%)	93 (33%)	.	.
Weight change from 5yrs	Mean (N, S.D.)	1.6 (118, 19.62)	-0.8 (164, 20.12)	4.8 (274, 19.7)	-1.6 (49, 14.48)	-0.8 (134, 15.69)	2.5 (108, 22.29)	0.6 (28, 21.12)	2.3 (248, 15.06)	13.9 (8, 21.05)	0.8 (1164, 18.02)	1.2 (281, 19.66)	0.020	0.495
Weight change from 10yrs	Mean (N, S.D.)	9.4 (117, 25.22)	5.7 (162, 20.49)	14.1 (269, 23.55)	4.2 (48, 22.34)	2.8 (133, 19.9)	7 (108, 24.53)	9.3 (28, 22.96)	7.5 (249, 17.63)	33.8 (8, 31.71)	7.5 (1155, 21.13)	5.9 (277, 23.93)	<.001	0.149
Overall Health Assessment	Missing	0 (0%)	3 (3%)	2 (2%)	1 (1%)	3 (3%)	0 (0%)	1 (1%)	5 (5%)	0 (0%)	24 (2%)	5 (5%)	<.001	0.001

Variable	Level	Ovarian	Uterine	Cervical	Lung	Colon	Lymphoma	Leukemia	Melanoma	Brain	Other	Multiple	Unadjusted p-value	Age Adjusted p-value
	excellent	17 (14.3%)	24 (14.8%)	49 (17.9%)	3 (6.3%)	12 (9%)	7 (6.5%)	4 (14.8%)	42 (17.2%)	2 (25%)	174 (15.2%)	21 (7.6%)	.	.
	very good	37 (31.1%)	44 (27.2%)	94 (34.3%)	9 (18.8%)	46 (34.3%)	42 (38.9%)	8 (29.6%)	93 (38.1%)	3 (37.5%)	415 (36.2%)	87 (31.4%)	.	.
	good	42 (35.3%)	66 (40.7%)	98 (35.8%)	22 (45.8%)	47 (35.1%)	36 (33.3%)	8 (29.6%)	79 (32.4%)	2 (25%)	403 (35.1%)	106 (38.3%)	.	.
	fair/poor	23 (19.3%)	28 (17.3%)	33 (12%)	14 (29.2%)	29 (21.6%)	23 (21.3%)	7 (25.9%)	30 (12.3%)	1 (12.5%)	155 (13.5%)	63 (22.7%)	.	.
Vitamins	Mean (N, S.D.)	2.4 (118, 2.47)	2.8 (164, 2.75)	2 (274, 2.14)	2.7 (48, 2.74)	2.3 (133, 2.03)	2.3 (107, 2.43)	2.1 (28, 2.62)	2 (240, 2.27)	1.3 (8, 1.04)	2.3 (1154, 2.37)	2.2 (278, 2.19)	0.040	0.365
Cat # Vitamins		1 (1%)	1 (1%)	2 (2%)	1 (1%)	4 (4%)	1 (1%)	0 (0%)	9 (9%)	0 (0%)	17 (17%)	4 (4%)	0.300	0.821
	None	22 (18.6%)	27 (16.5%)	71 (25.9%)	8 (16.7%)	20 (15%)	26 (24.3%)	7 (25%)	59 (24.6%)	2 (25%)	208 (18%)	54 (19.4%)	.	.
	1	31 (26.3%)	33 (20.1%)	62 (22.6%)	10 (20.8%)	32 (24.1%)	23 (21.5%)	7 (25%)	55 (22.9%)	3 (37.5%)	274 (23.7%)	74 (26.6%)	.	.
	2	22 (18.6%)	36 (22%)	54 (19.7%)	12 (25%)	36 (27.1%)	24 (22.4%)	8 (28.6%)	62 (25.8%)	2 (25%)	291 (25.2%)	61 (21.9%)	.	.
	3+	43 (36.4%)	68 (41.5%)	87 (31.8%)	18 (37.5%)	45 (33.8%)	34 (31.8%)	6 (21.4%)	64 (26.7%)	1 (12.5%)	381 (33%)	89 (32%)	.	.
CAM	Mean (N, S.D.)	1.1 (117, 1.42)	1.1 (161, 1.33)	1.1 (270, 1.24)	0.7 (48, 0.99)	0.6 (129, 0.86)	1 (105, 1.41)	1.2 (28, 1.22)	1.1 (245, 1.22)	0.9 (7, 1.46)	1.1 (1135, 1.21)	1.1 (272, 1.31)	0.020	0.069
Cat # CAM		2 (2%)	4 (4%)	6 (6%)	1 (1%)	8 (8%)	3 (3%)	0 (0%)	4 (4%)	1 (1%)	36 (3%)	10 (10%)	0.280	0.404
	None	52 (44.4%)	69 (42.9%)	114 (42.2%)	26 (54.2%)	73 (56.6%)	52 (49.5%)	10 (35.7%)	101 (41.2%)	4 (57.1%)	463 (40.8%)	116 (42.6%)	.	.
	1	28 (23.9%)	43 (26.7%)	76 (28.1%)	13 (27.1%)	35 (27.1%)	28 (26.7%)	9 (32.1%)	72 (29.4%)	2 (28.6%)	325 (28.6%)	71 (26.1%)	.	.
	2	24 (20.5%)	28 (17.4%)	48 (17.8%)	8 (16.7%)	17 (13.2%)	12 (11.4%)	5 (17.9%)	39 (15.9%)	0 (0%)	208 (18.3%)	44 (16.2%)	.	.
	3+	13 (11.1%)	21 (13%)	32 (11.9%)	1 (2.1%)	4 (3.1%)	13 (12.4%)	4 (14.3%)	33 (13.5%)	1 (14.3%)	139 (12.2%)	41 (15.1%)	.	.
Supplements	Mean (N, S.D.)	0.3 (114, 0.72)	0.2 (158, 0.56)	0.3 (259, 0.7)	0.2 (43, 0.67)	0.2 (129, 0.6)	0.2 (102, 0.67)	0.1 (28, 0.45)	0.2 (238, 0.62)	0 (7, 0)	0.2 (1112, 0.66)	0.3 (268, 0.86)	0.920	0.680
Cat # Supplements		5 (5%)	7 (7%)	17 (7%)	6 (6%)	8 (8%)	6 (6%)	0 (0%)	11 (11%)	1 (1%)	59 (5%)	14 (14%)	0.960	0.985
	None	95 (83.3%)	136 (86.1%)	210 (81.1%)	37 (86%)	110 (85.3%)	88 (86.3%)	25 (89.3%)	201 (84.5%)	7 (100%)	921 (82.8%)	225 (84%)	.	.
	1	12 (10.5%)	16 (10.1%)	34 (13.1%)	5 (11.6%)	11 (8.5%)	9 (8.8%)	2 (7.1%)	25 (10.5%)	0 (0%)	139 (12.5%)	27 (10.1%)	.	.
	2	5 (4.4%)	3 (1.9%)	6 (2.3%)	0 (0%)	6 (4.7%)	2 (2%)	1 (3.6%)	9 (3.8%)	0 (0%)	33 (3%)	10 (3.7%)	.	.

Variable	Level	Ovarian	Uterine	Cervical	Lung	Colon	Lymphoma	Leukemia	Melanoma	Brain	Other	Multiple	Unadjusted p-value	Age Adjusted p-value
	3+	2 (1.8%)	3 (1.9%)	9 (3.5%)	1 (2.3%)	2 (1.6%)	3 (2.9%)	0 (0%)	3 (1.3%)	0 (0%)	19 (1.7%)	6 (2.2%)	.	.